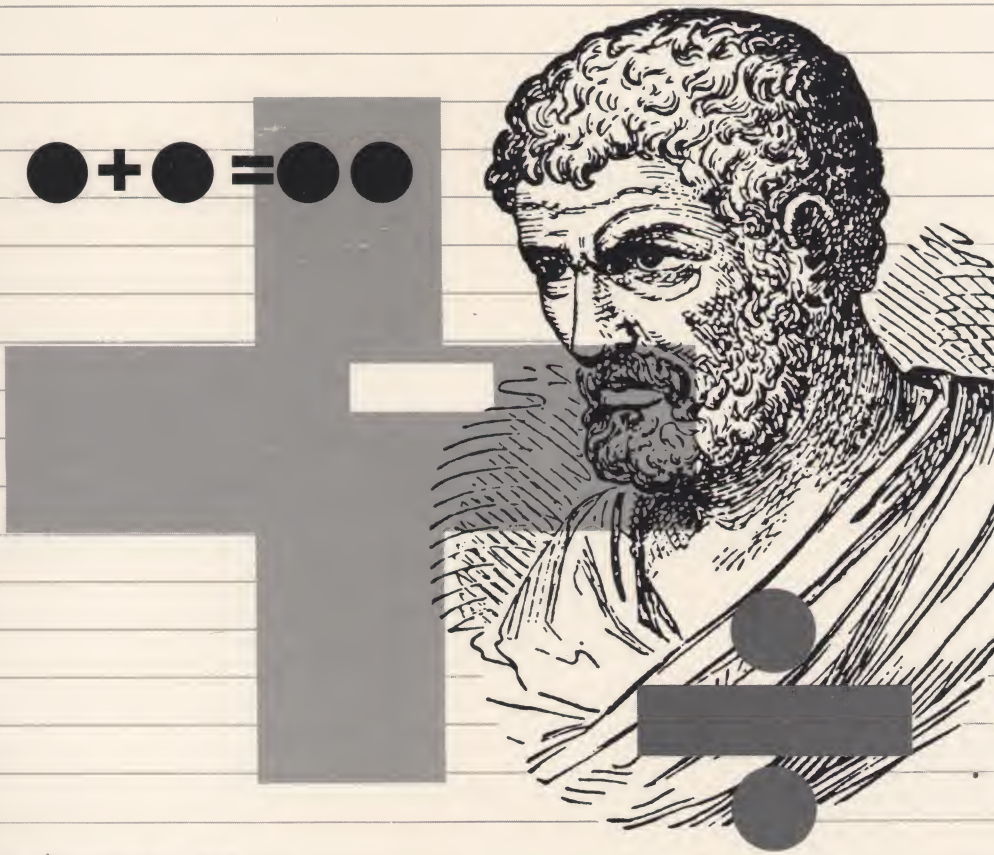
Secret Formula elementary



ATARI®
LEARNING SYSTEMS

Table of Contents

Using This Program at Home

Many ATARI® Learning Systems program manuals were originally designed for use by teachers in the classroom. The programs themselves, however, are no less engaging and instructive for "independent learners"—children, students, and adults—working at home.

Every manual includes a "Getting Started" section that explains how to load the program into your computer system quickly and easily. Since many basic prompts and other instructions are displayed right on your screen, that's all you'll need to begin learning and exploring with most ATARI Learning Systems programs. But whether you're a parent, a tutor, or a home learner teaching yourself, it's a good idea to look through the teaching materials in your manual. You're likely to find important details on using the program, valuable supplementary information on its subject matter, and some creative ideas for getting the most educational and entertainment value out of your ATARI Learning Systems program.

Introduction

Some math programs are simply drills for testing your memory. SECRET FORMULA is for the budding mathematician—a program that teaches you to think deeply and increase your mathematical aptitude.

SECRET FORMULA lets you interact creatively with the computer. A formula is hidden. It's up to you to guess the numbers, analyze the computer's response to your numbers, and then try to figure out the formula. Once you understand this program, SECRET FORMULA will help you write new formulas to try on your friends and classmates.

Follow these steps to load the SECRET FORMULA program into your ATARI computer system:

1. With your computer turned off, turn on your television set or monitor and disk drive. Wait for the busy light on the disk drive to go out.

2. If your computer is *not* equipped with built-in ATARI BASIC, insert an ATARI BASIC cartridge in the cartridge slot (the left cartridge slot on the ATARI 800® computer).

3. Insert the SECRET FORMULA diskette in your disk drive (disk drive 1, if you have more than one drive) and close the disk drive door or latch.

4. Turn on your computer. As your disk drive goes to work, you'll hear a beeping sound. After a few moments, the SECRET FORMULA title screen will appear.

Because your computer loads portions of the program as you use them, you must leave the SECRET FORMULA diskette in your disk drive while working with the program.

To begin learning with SECRET FORMULA, simply follow the instructions on your screen. You can select from Levels 1–7 in the Beginning SECRET FORMULA program, Levels 8–10 in the Intermediate program, and Levels 11–13 in the Advanced program. Higher levels are more difficult than lower ones. In Levels 1–12, you can choose from 10, 15, or 20 "steps," or formulas of increasing difficulty. With Level 13, you can create your own

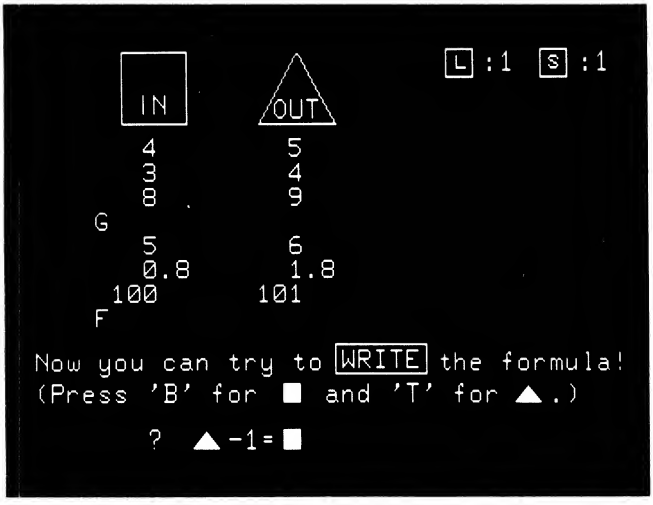
SECRET FORMULA (to save your own formulas, you'll need a formatted data diskette).

It's a good idea to follow a level-by-level, step-by-step path through the program, especially on your first time through. You may choose another level or step from anywhere in the program by entering S and RETURN any time you're prompted for an entry.

The instructions that follow are based on Level 1, step 1 of the Beginning SECRET FORMULA program; but every Level and step works in the same way.

SECRET FORMULA has three parts. Each part uses a different screen display.

Guessing the Formula



1. Enter a number and **RETURN**.

   Your number is displayed in the □ column while the computer's result is displayed in the △ column. Keep entering numbers until you know the formula.

2. Enter **G** and **RETURN**.

   You think you know the formula. You're now in Guess Mode and the screen is framed in red.

3. Enter a number for □ and **RETURN**.

4. Enter a number for △ and **RETURN**.

   The computer tells you if you're CORRECT or asks you to TRY AGAIN. Try as many □ and △ pairs as you like.

For help, enter **H** and **RETURN** and the correct △ number is displayed. (**H** takes you out of Guess Mode. Notice that the red frame disappears. Enter **G** and **RETURN** to reenter Guess Mode as in Step 2.)

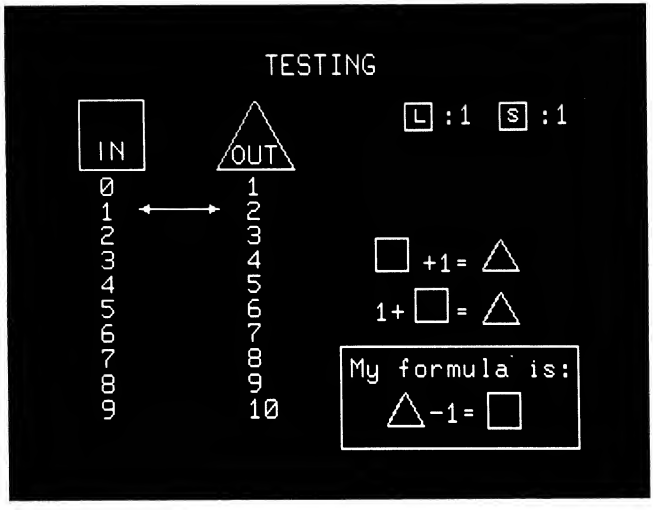
5. Enter **F** and **RETURN**.

   You're ready to write the SECRET FORMULA. Use the numeric keys **0** through **9** and the following symbols:

   B for □
   T for △
   + for addition or positive sign
   − for subtraction or negative sign
   ***** for multiplication
   / for division
   = for equals
   (and **)** for operation to be performed first
   B and **2** for $\square^2$
   B and **3** for $\square^3$

   Write the SECRET FORMULA correctly or enter **H** and **RETURN** for help and you go directly to the second part of the program.

Testing the Formula



6. Use the ↑ or → keys to move the ⟷ cursor and enter **RETURN**.

   Move the cursor alongside the ordered pair you wish to test first. Enter **RETURN** and see what happens. Test all of the pairs.

7. Enter **C** and **RETURN** to continue to the last part of the program.

Discoveries

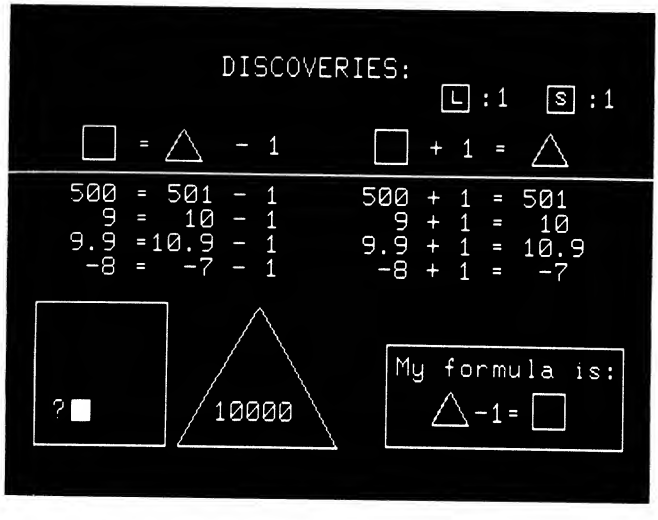
8. Use the ← or → keys to select □ or △ as your first entry. (For Levels 8-12, you must enter □ first.)

   Move the '?' prompt into the □ or △. Choosing the △ first is like putting the computer into reverse. You see what comes out and have to compute what went in!!

9. Enter a value for □ (or △) and **RETURN**. Enter the corresponding value for △ (or □) and **RETURN**.

Correct entries are displayed as equations at the top of the screen or a "beep" reminds you to try again. Help is not available in Discoveries. If you cannot compute the correct □ or △, enter **RETURN** to replace your original entry with another or...

10. Press **C** and **RETURN** to continue to a new SECRET FORMULA.



Writing the Formula and Hidden Messages

Since there are an infinite number of ways to correctly write the formula, your equation may not match one of the many formulas stored in the computer's memory. If you can't think of another way to write your equation, enter **H** and **RETURN** and two of the possible formulas will be displayed for you.

Because of the great increase in the number of possible correct formulas at higher levels, rules for writing the formulas are inserted at four different places in the program. Be sure to read these important messages when they appear and remember to use the new rules.

Creating Your Own Secret Formula With Level 13

You can create your own SECRET FORMULA with Level 13 of the Advanced program.

In order to save your own SECRET FORMULA, you'll need a formatted data diskette. The data diskette doesn't require DOS.

The Testing display at Level 13 is limited to four characters to the left and right of the decimal point. Though calculations will remain correct, you may overwrite the screen display if these limits are exceeded. Also, don't try to save a file not created with Level 13 onto your data diskette.

Deleting and Escaping

Use **DELETE BACK-S** to erase the last character of entry before pressing **RETURN**. You can erase an entry in Guess Mode or Discoveries by entering an additional **RETURN**.

Fractions and Decimals

Values less than 1 and mixed numbers must be expressed as decimals to be read by most computers. Use 1.25 for 1¼ which the computer would read as 1 1/4 or eleven divided by four. Similarly, use .5 for ½, .333 for ⅓, and so forth.

Some computers will automatically display a 0 in the one's place for values less than 1. EXAMPLE: You enter .5 and 0.5 is displayed.

Character Limits

In Guessing the Formula, entries are limited to six characters to the left of the decimal with a maximum of nine characters including the decimal point and negative sign.

In Discoveries, the first entry is limited to five characters, the second entry to six characters.

Technical Notes

Different sets of background colors are used for Testing and Discoveries, depending whether you write the formula yourself or ask for help.

Extraneous or illegal entries will cause the program to advance as if **C** and **RETURN** had been entered.

Error on Disk— Check System

Press any key to continue or **SYSTEM RESET** if this message appears.

Helpful Hints

Ask yourself some of these questions if you need help in discovering a SECRET FORMULA. You'll know the answer to all of these questions and more by the time you complete Level 12.

- Is the number always getting larger or smaller?
- Does the number ever stay the same? When?
- What does it mean if you get a negative result?
- How can you prevent a negative result?
- When do you get 0 as the △?
- When do you get 1 as the △?
- Are there other formulas that work for the same pairs of numbers? Why?
- How can you tell if something is being added or subtracted?
- How can you tell if something is being multiplied or divided?
- What happens to indicate that more than one operation is being performed?
- What happens if you enter only odd numbers? even numbers?
- What happens if you enter negative numbers?
- When do you get a △ less than 1?

Use in an Instructional Setting

The main objective of SECRET FORMULA is to foster an understanding of key mathematical concepts through exploration of number patterns and relationships. The suggestions and examples in this section of the *User's Guide* are intended as starting points for further exploration in an instructional setting. Typical ideas for classroom discussion are listed below. The Scope and Sequence Chart is included to provide an instant overview of the program. And the collection of Messages which complete the *User's Guide* were developed by teachers and students for use with the SECRET FORMULA program.

Classroom Activities

Motivation and Social Relevance

Lead a discussion in the ways numbers, mathematical formulas, and scientific notations are used to describe phenomena in our physical world. Then ask students if they can think of things we use in our daily lives which use numbers or graphics to represent:

- How something feels (hot or cold; dry or wet)
- How something looks (large or small; tall or short)
- How something moves (up or down; slow or fast)
- Where something is located (near or far; right or left)
- What something is made of

Use in an Instructional Setting

The responses will vary according to the age and experience level of the group. Some sample responses are listed here. Many responses are appropriate for more than one of the categories of questions.

- Thermometers measure temperature on a line graph
- Weather instruments reflect wind direction, humidity, and air currents
- Seismographs represent movements of the earth
- EKGs represent heart muscle movements on a graph
- Chemical equation for photosynthesis; molecular structure (H_2O)
- Sonar; radar
- Formulas for calculating speed, velocity direction, and resistance
- Architect's plans; engineering specifications
- Recipes
- Formulas for perfume or paint
- Robotics
- Moves in a chess game
- Directions to a friend's house

Record Keeping

Encourage students to keep an individual record of their progress, including date, level, step, hidden messages found, personal discoveries, formulas created, and so forth. Allow students to create task cards for their classmates when they discover an unusual relationship.

Use in an Instructional Setting

Formula Creation

Some of the most important discoveries will take place when students attempt to create their own formulas. Here are a few examples of Level 13 formulas which produce interesting results.

Formula Created	Most Likely Solution
△ = □ + (10*2)/4	△ = □ + 5
△ = □ * 1000 + □	△ = □ * 1001
△ = (3*□) + (3*□)	△ = □ * 6
△ = 100 * (□ + 10)	△ = □ * 100 + 1000

Extend learning by graphing the ordered pairs. What is the slope? What is the intercept? Which formulas produce line graphs? curves? Is there a relationship to be discovered?

Use known formulas such as the area of a rectangle or square to give identity to the □ and △ values. For example, the □ number represents the side of a square; the △ the area of the square. The formula would be: □ * □ = △ or $□^2 = △$. Similar examples can be used to create formulas which show the relationship between area and perimeter; distance, rate, and time; circumference and diameter; seconds and minutes; and area and altitude.

Scope and Sequence Chart

Level	Testing Display	Discoveries Display	Other Formulas Receiving "Right" Message		Steps Values for n	Notes/ Other Equivalent Formulas
1	b+n=t n+b=t	b=t−n b+n=t	n=t−b t=b+n t=n+b	t−b=n t−n=b	1,4,7,5,10,12,60,100, 340,415,7000,.5,.7,99, 3.2	
2	b+t=n n−b=t	b+t=n n−b=t	t+b=n n−t=b t=n−b	n=b+t n=t+b b=n−t	11,15,17,19,14,13,18, 50,66,100,15.5,99, 101,1000,1	
3	b+b=t f*b=t b*n=t n*b=t	b=t/f b*f=t	t=b*n b=t/n n=t/b (Identity equations for step 4.)	t=n*b t/n=b t/b=n	2,4,3,1 occurence of b as an addend; represented by 'f') 5,10,20,40,60,100, 300,500,200,220,111	MESSAGE 1 after step 4.
4	b/n=t b=t*n	b=t*n b/n=t	t*n=b t=b/n t=b*1/n t=1/n*b	b=n*t n*t=b b/t=n n=b/t b*1/n=t 1/n*b=t	2,5,4,1,10,100,50,20, 40,25 (plus identity equations for step 4)	t/b=1/n 1/n=t/b
5	b=t/n t/b=n	b=t/n t/b=n	t=b*n b*n=t t/n=b	t=n*b n*b=t n=t/b	3,7,8,10,12,18,20,126, 200,500	MESSAGE 2 after step 10 b/t=1/n 1/n=b/t

Level	Testing & Discoveries	Right Formulas	Additional Right Formulas	Steps Values for (n) and y
6	(b*n) + y = t	(n*b) + y = t y + (n*b) = t y + (b*n) = t	Same formulas without parentheses.	(2) + 3,(2) + 8,(2) + 5, (4) + 5,(3) + 5,(7) + 5, (3) + 2,(6) + 4, (10) + 10,(20) + 1, (100) + 9,(70) + 6, (50) + 1,(10) + .5, (90) + 88,(3) − 5, (8) − 2,(3) − 3, (20) − 10,(100) − 1
7	(b/n) + y = t	y + (b/n) = t (b*1/n) + y = t y + (1/n*b) = t y + (b*1/n) = t (1/n*b) + y = t	Same formulas without parentheses. When n = 1 at step 15 b + y = t and y + b = t.	(2) + 6,(2) + 10, (10) + 7,(5) + 3,(4) + 2, (10) − 8,(2) − 3, (100) + 4,(500) + 9, (4) − 12,(10) + .25, (10) − .5,(500) + 99, (100) + 99,(1) + 1

Key:

b - box (□)
t - triangle (△)
n - value for first variable
y - value for second variable
f - represents the number of times box (b) occurs as an addend at Level 3, steps 1-4
l/n is always expressed as a decimal

Scope and Sequence Chart

In Discoveries, box must be entered first for Levels 8-12.

Level	T&D Display	Others	Other Formulas Receiving "Right" Message	Steps Values for (n) and y	Notes/ Other Equivalent Formulas
8	(b*b) + n = t b2 + n = t	n + (b*b) = t n + b2 = t	Same formulas without parentheses Step 1: $b^2 = t$	0,3,8,1,5, − 5, − 30, − 100, − 80,b. Step 10:	MESSAGE 3 after Step 5. b*(b + 1) = t
9	b2*n = t	n*b2 = t	Step 5: $b^2 = t$	3,8,4,7,1,10,30,100,.1, .5.	MESSAGE 4 after Step 10.
10	b2 + (b*n) = t	b2 + (n*b) = t	Same formulas without parentheses. Step 1: $b^2 + b = t$	1,3,5,8,10, − 6, − 2, − .1, − 2.5,30.	Step 1 same as Level 8 Step 10
11	b2 + (b*n) + y = t	b2 + (n*b) + y = t b2 + y + (n*b) = t b2 + y + (b*n) = t	Same formulas without parentheses.	(3) + 4,(3) + 9,(5) + 10, (5) + 2,(7) + 3,(10) − 3, (4) − 3,(2) − 2,(− 2) − 2, (− 2) + 2,(− 10) + 5, (− 10) − 5,(.5) − 3, (1) − .5,(1.1) + .1	When do you get the same triangle for different box values?
12	b2/n = t			2,4,5,10,3,.5,1.1,.01, 100,1.5 Step 6: Step 8:	b = t when b = n t = 1/n when b = 1 b2*2 = t b2*100 = t

Key:

b - box (□)
t - triangle (△)
n - value for first variable
y - value for second variable
f - represents the number of times box (b) occurs as an addend at Level 3, steps 1-4
l/n is always expressed as a decimal

Use in an Instructional Setting

Messages

Message 1

From now on use □ * 2 instead of □ + □ and use □ * 3 instead of □ + □ + □ and so on for all factors of □.

Message 2

For Levels 6 through 12, write formulas in the form ENDING WITH = △.
Examples:

□*3 = △ NOT △ = 3*□ or △ = □*3 or □ = △/3

□/10 = △ NOT △ = □/10 or □ = △*10

□ + 100 = △ NOT □ = △ − 100

or

100 + □ = △ NOT □ = △ − 100

Message 3

From now on, use $□^2$ for □ * □
Example:

$□^2$ + 2 = △ NOT (□ * □) + 2 = △

Message 4

From now on, write $\square^2$ FIRST if it is part of the formula.
Examples:

$\square^2 + 10 = \triangle$ NOT $10 + \square^2 = \triangle$
$\square^2 * 5 = \triangle$ NOT $5 * \square^2 = \triangle$

Every effort has been made to ensure the accuracy of the product documentation in this manual. However, because we are constantly improving and updating our computer software and hardware, Atari, Inc. is unable to guarantee the accuracy of printed material after the date of publication and disclaims liability for changes, errors or omissions.

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P.O. Box 61657
Sunnyvale, CA 94088
Printed in U.S.A.

C024784-020 REV. A

AED80020